

What is claimed is:

1 1. A method for forming a power generator,
2 comprising the steps of:

3 providing a first insulation element;

4 forming a first metal layer on a lower surface of
5 the first insulation element;

6 creating a recess substantially aligned with the
7 first metal layer on the first insulation
8 element;

9 filling the recess with a second insulation element;

10 constructing a magnetic film on the recess of the
11 first insulation element;

12 forming a third insulation element on the magnetic
13 film, wherein the third insulation element
14 substantially aligns with the second insulation
15 element;

16 forming a fourth insulation element on the first
17 insulation element and magnetic film, wherein

18 the fourth insulation element receives the
19 third insulation element;
20 forming a fifth insulation element on the third and
21 fourth insulation elements;
22 forming at least one first through-groove on the
23 fifth insulation element, wherein the first
24 through-groove is located on the third
25 insulation element;
26 forming a sixth insulation element on the fifth
27 insulation element and in the first through-
28 groove;
29 forming a plurality of second through-grooves on the
30 sixth insulation element, wherein the second
31 through-grooves are located on the fifth
32 insulation element;
33 forming a seventh insulation element on the sixth
34 insulation element and in the second through-
35 grooves;

36 removing the second, third and sixth insulation
37 elements to form a vibration chamber, wherein
38 the magnetic film is in the vibration chamber;
39 evacuating the vibration chamber to create a vacuum;
40 sputtering a second metal layer on the fifth and
41 seventh insulation elements;
42 forming a first coil circuit and a second coil
43 circuit on the first metal layer and second
44 metal layer, respectively; and
45 connecting the first and second coil circuits to an
46 electricity storage device.

1 2. The method as claimed in claim 1, wherein the
2 first, fourth, fifth and seventh insulation elements are
3 SiN.

1 3. The method as claimed in claim 1, wherein the
2 second, third and sixth insulation elements are composed
3 of the same materials.

1 4. The method as claimed in claim 1, wherein the
2 second, third and sixth insulation elements are
3 fluorinated silicate glass (FSG) or spin on glass (SOG).

1 5. The method as claimed in claim 1, wherein the
2 first through-groove is formed by etching.

1 6. The method as claimed in claim 1, wherein the
2 plurality of second through-grooves are formed by
3 etching.

1 7. The method as claimed in claim 1, wherein the
2 second, third and sixth insulation elements are removed
3 by wet etching.

1 8. The method as claimed in claim 7, wherein the
2 wet etching uses HF solution to remove the second, third
3 and sixth insulation elements.

1 9. The method as claimed in claim 1, wherein the
2 created vacuum provides pressure of approximately 10^{-6}
3 torr.

1 10. The method as claimed in claim 1, wherein the
2 first coil circuit and second coil circuit are
3 respectively formed on the first metal layer and second
4 metal layer by photolithography and etching.

1 11. The method as claimed in claim 1, wherein the
2 first coil circuit and second coil circuit are
3 respectively formed on the first metal layer and second
4 metal layer by printing.

1 12. The method as claimed in claim 1, wherein the
2 electricity storage device is a capacitor.

1 13. The method as claimed in claim 1, wherein the
2 electricity storage device is a battery.

1 14. A power generator, comprising:
2 a first substrate;
3 a second substrate disposed on the first substrate,
4 wherein a vibration chamber is formed between
5 the first substrate and second substrate;

6 a magnetic film disposed between the first substrate
7 and second substrate and located in the
8 vibration chamber, wherein the magnetic film
9 has a predetermined magnetic field;

10 a first metal layer disposed under the first
11 substrate and substantially aligned with the
12 vibration chamber;

13 a second metal layer disposed on the second
14 substrate and substantially aligned with the
15 vibration chamber; and

16 an electricity storage device electrically coupled
17 to the first metal layer and second metal
18 layer.

1 15. The power generator as claimed in claim 14,
2 further comprising a first circuit and a second circuit,
3 the electricity storage device connected to the first
4 metal layer through the first circuit and connected to
5 the second metal layer through the second circuit.

1 16. The power generator as claimed in claim 15,
2 further comprising a first insulation control switch and
3 a second insulation control switch, the first insulation
4 control switch disposed on the first circuit, and the
5 second insulation control switch disposed on the second
6 circuit.

1 17. The power generator as claimed in claim 16,
2 wherein the first insulation control switch and second
3 insulation control switch are N-type transistors (NMOS).

1 18. The power generator as claimed in claim 14,
2 wherein the first substrate and second substrate are
3 composed of insulating materials.

1 19. The power generator as claimed in claim 14,
2 wherein the first metal layer further comprises a first
3 coil circuit, and the second metal layer further
4 comprises a second coil circuit.

1 20. The power generator as claimed in claim 19,
2 wherein the first coil circuit and second coil circuit

3 are respectively formed on the first metal layer and
4 second metal layer by photolithography and etching.

1 21. The power generator as claimed in claim 19,
2 wherein the first coil circuit and second coil circuit
3 are respectively formed on the first metal layer and
4 second metal layer by printing.

1 22. The power generator as claimed in claim 14,
2 wherein the vibration chamber is a vacuum.

1 23. The power generator as claimed in claim 22,
2 wherein the vacuum provides pressure of approximately 10^{-6}
3 torr.

1 24. The power generator as claimed in claim 14,
2 wherein the electricity storage device is a capacitor.

1 25. The power generator as claimed in claim 14,
2 wherein the electricity storage device is a battery.

1 26. The power generator as claimed in claim 14,
2 wherein the first and second substrates are SiN.

1 27. A power generator, comprising:

2 a magnetic film suspended within a vibration
3 chamber;

4 first and second coils disposed on opposing sides of
5 the magnetic film, the first and second coils
6 configured to generate induced currents
7 resulting from a changing magnetic field of the
8 magnetic film, resulting from vibrations
9 thereof; and

10 an electricity storage device electrically coupled
11 to the first and second coils, the electricity
12 storage device configured to store electrical
13 energy delivered from induced currents in the
14 first and second coils.

1 28. A semiconductor device, comprising:

2 a semiconductor chip;

3 a power generator embedded in the semiconductor chip
4 for obtaining electric power by converting

5 vibration energy into electric energy, the

6 power generator comprising:

7 a first substrate;

8 a second substrate disposed on the first substrate,

9 wherein a vibration chamber is formed between

10 the first substrate and second substrate;

11 a magnetic film disposed between the first substrate

12 and second substrate and located in the

13 vibration chamber, wherein the magnetic film

14 has a predetermined magnetic field;

15 a first metal layer disposed under the first

16 substrate;

17 a second metal layer disposed on the second

18 substrate; and

19 an electricity storage device electrically coupled

20 to the first metal layer and second metal

21 layer.

1 29. A method for forming a power generator,

2 comprising the steps of:

3 providing a first insulation substrate;
4 forming a first metal layer on a lower surface of
5 the first insulation substrate;
6 forming a second insulation substrate on the first
7 insulation substrate;
8 defining a vibration chamber between the first
9 insulation substrate and second insulation
10 substrate;
11 dividing the vibration chamber by forming a magnetic
12 film between the first insulation substrate and
13 second insulation substrate; and
14 forming a second metal layer on the second
15 insulation substrate.